

# JCSDA Outlook

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Acting Director

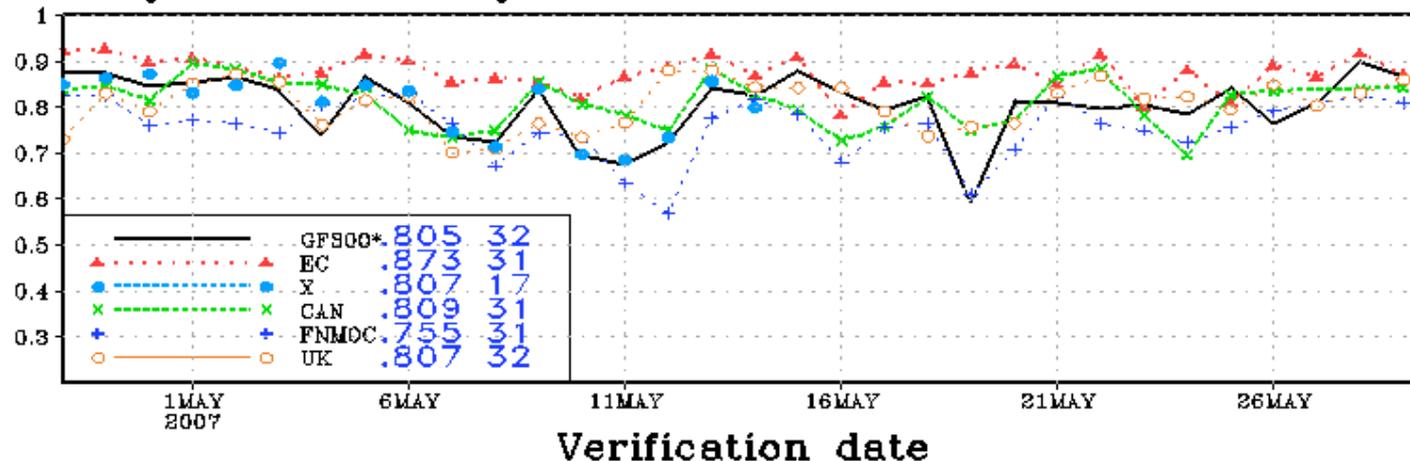
- New satellites and sensors
- Scientific challenges
  - Clouds/precip
  - Direct assimilation of imager data
- Assimilation/forecast system development
  - 4D-VAR? ... Ensemble-based methods?
- New subject areas
  - Climate
  - Oceans
  - OSSE/Mission assessment capability
  - Trace gas/aerosol
- How do we manage all this?

# Why bother?

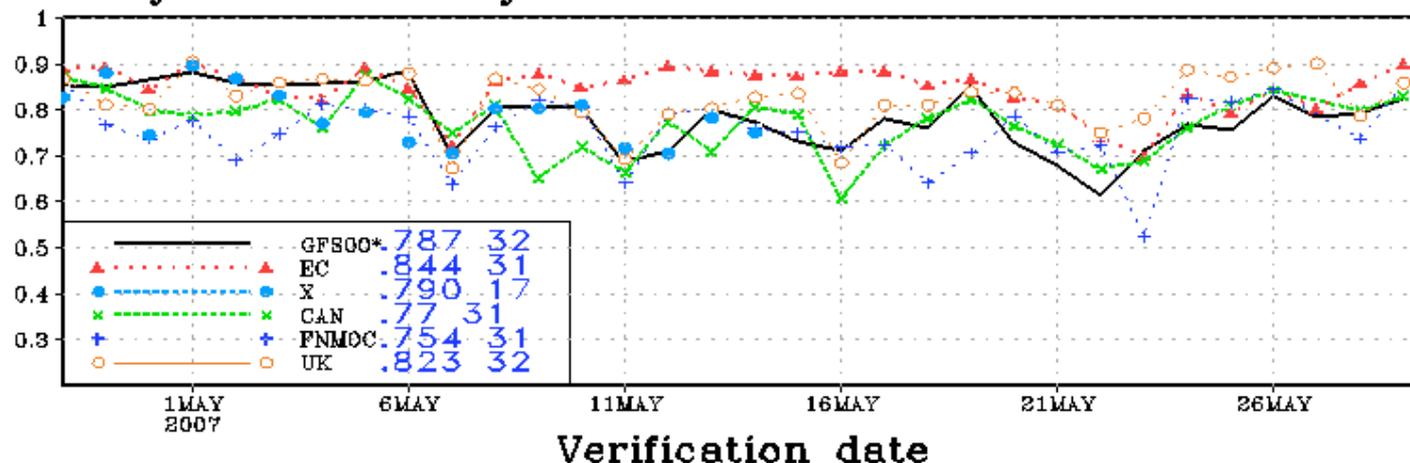
- According to the US Dept of Commerce, “weather” impacts roughly 20% of the total US economy, corresponding to ~\$2.5 trillion annually
  - If 10% of this is forecast sensitive, we are looking at a potential \$250B annual benefit
  - Assume that the benefit is linearly distributed between two extremes:
    - marginal forecast skill at 0 hours: A \$0 benefit
    - marginal skill at a range of two weeks: a \$250B benefit
- => Benefit of \$0.75B per year for each hour gained in forecast skill*
- Forecast skill will not automatically improve just because we launch more (and better) satellites
    - Investing in JCSDA and its partners is every bit as essential as investing in the space hardware

Anomaly correlations for 5-day forecasts of 500-hPa heights for various models verifying during the last 31 days. Average values and number of forecasts are shown in insets.

Anomaly Correl day 5 Z 500mb n hem lat 20-80



Anomaly Correl day 5 Z 500mb s hem lat 20-80



# New sensors

- Metop (IASI, ASCAT, GRAS, GOME-2...)
- OCO
- ADM
- NPP (VIIRS, ATMS, CrIS, OMPS)
- GPM
- NPOESS
- GOES-R
- GWOS, GIFTS, HES, GEO-MW,  
Molniya/MEO imager, US scatterometer, ....

# Orbiting Carbon Observatory (OCO)



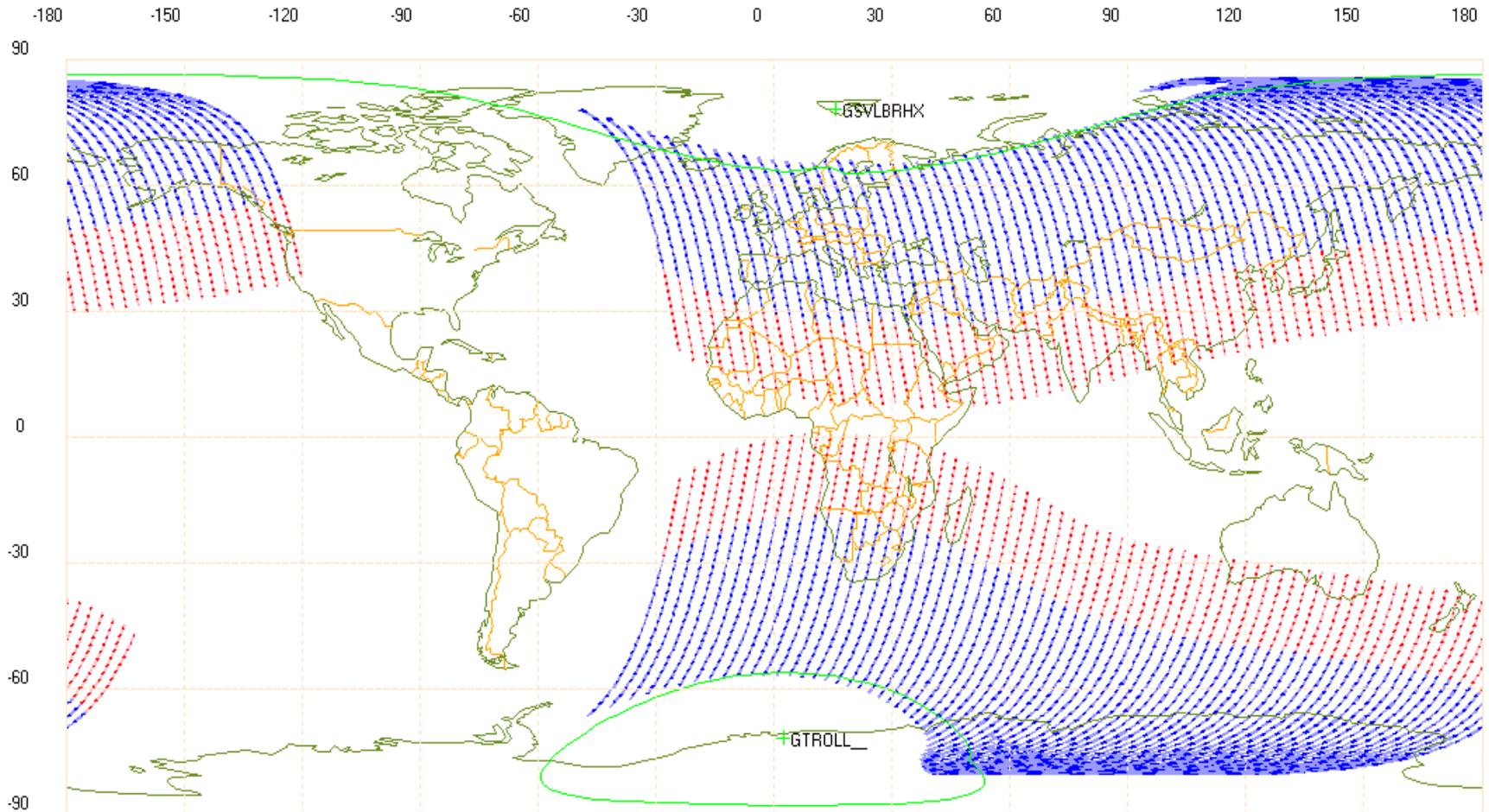
# Orbiting Carbon Observatory (OCO)

- Hyperspectral near-IR instrument targeting total CO<sub>2</sub> column
  - NASA research mission developed for a 2009 launch
  - Primary application is sources and sinks estimation
  - Data assimilation is essential step toward meeting that goal
- CO<sub>2</sub> column measurement independent of surface pressure
  - => OCO will provide first ever surface pressure measurement from space (over land, in cloud free areas)
  - No product generation/data dissemination plan to support real-time applications
  - JCSDA planning to do impact experiments

# ADM/Aeolus

- ESA Doppler Wind Lidar demonstration mission scheduled for 2009 launch
- First direct measurement of winds from space
  - Single vector component, 200 km along-track spacing, ~1 km vertical resolution
- Data freely available to operational NWP community after commissioning period
  - JCSDA will be part of Cal-Val team; data available from when the instrument is turned on
- New data type; new science, new problems
- Experience with ADM will be useful for GWOS
- Opportunity for NOAA to help the data dissemination

## case 3 - QRT coverage (Svalbard + Troll, all dump opportunities)



# NPOESS Preparatory Project (NPP)

- Flight demonstration of four critical NPOESS sensors:
  - CrIS
  - VIIRS
  - ATMS
  - OMPS
- JCSDA working with project team to prepare for data coming in 2009
- Product generation and product dissemination plans still causes for concerns

# NPOESS

- C-1 in 2013
- NPP + additional sensors
- Real-time data dissemination via SafetyNet
- JCSDA needs to be prepared

# Coming attractions ...

- JCSDA receives frequent requests from agencies concerning the expected impact of proposed future systems and sensors
- These cannot be properly responded to
- A sustained Observing System Simulation Experiment capability is needed
- Ongoing informal OSSE collaboration involving groups from NASA, NOAA and Europe (ECMWF and KNMI)
- NASA and NOAA appear to be receptive to a JCSDA-led coordinated OSSE effort
  - Plans are under development

# GOES-R

- Currently scheduled for launch in 2014
- ABI is the key sensor; higher spectral, spatial and temporal resolution w.r.t. current GEO imagers
- Several other sensors still being studied (GEO IR sounder, GEO MW sounder)

# Climate

- Has been on the agenda for the JCSDA since inception
- Traditionally linked with seasonal to interannual prediction
- Reanalysis for climate discussed sporadically
- Climate OSSE

# Oceans

- Historically, ocean data assimilation in JCSDA seen as serving two primary purposes
  - Lower boundary conditions for NWP models
  - Seasonal to interannual prediction
- Altimeter
- Ocean color
- Need to develop JCSDA plan
  - NESDIS person assigned to JCSDA (Eric Bayler) tasked with developing NOAA plan for ocean DA
  - To be discussed at June Executive Retreat

# Data assimilation systems

- Satellite data are asynoptic in nature
- Background error covariances evolve over time, especially multivariate components
  - ⇒ High temporal resolution data assimilation systems with state-dependent background error covariances will be needed
- Ensemble based?
- 4D-VAR?
- How many different systems?
  - Three separate global 4D-VAR systems in development within the JCSDA partners

# Scientific challenges

- Clouds and precipitation
  - Assimilation of radiances over areas affected by clouds/and or precipitation
  - Better prognostic modeling of clouds and precipitation
- Direct assimilation of imagery data
  - “People can make sense of animated sequences of GEO-imagery; why can’t data assimilation systems do the same?”

# Managing the effort

- JCSDA future ripe with potential and opportunities (and challenges)
- Planning tools
  - Annual plan
  - Program Operating Plan; roughly seven years out, used for budget requests
  - Strategic plan; outlines broader scientific vision for the JCSDA
    - The six core priorities listed are unchanged since the start of the JCSDA; prescience or lack of innovation?

# Managing the effort (II)

- JCSDA Executive
  - How do we improve coordination and communication
  - Avoid holes, avoid unnecessary duplication of effort
- JCSDA Technical Liaisons
  - We have world-class people on our roster, but the technical liaisons have not met since 2003
  - How do we make better use of them?
- Many of the issues presented here to be discussed at Executive Retreat in June